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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/052,451

01/18/2002

Rajiv Vasant Joshi

64,610-030A  
(YO994-172AX)

9238

7590

08/01/2002

Randy W. Tung  
Tung & Associates  
Suite 120  
838 W. Long Lake Road  
Bloomfield Hills, MI 48302

EXAMINER

BROPHY, JAMIE LYNN

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 08/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/052,451

Applicant(s)

JOSHI, RAJIV VASANT

Examiner

J. L. Brophy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 21-65 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-65 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

### DETAILED ACTION

This office action is in response to the application papers filed 1/18/02.

#### *Drawings*

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "12" and "14" have both been used to designate the oxide layer. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

#### *Claim Objections*

Claims 24, 50, 52-62 are objected to because of the following informalities:

in claim 24, line 1, "having" should be "has". ✓

in claim 50, line 2, "comprising" should be "comprises". ✓

in claim 52, line 1, "lest" should be "least". ✓

in claims 53-56, 58, 59 and 62, line 1, "encapsulated in" should be "surrounded at least on three sides by". ✓

in claim 57, line 1, "surrounded in" should be "surrounded at least on three sides by". ✓

in claim 62, line 1, "a large grain" should be "an". ✓

in claim 62, line 2, there is insufficient antecedent basis for the limitation "said hard dielectric layer". Claim 62 should be dependent upon claim 60. ✓

in claims 63 and 64, line 3, "substantially" should be "substantial".

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claims 21 and 25, the limitation "sufficiently large" is vague and indefinite as to the grain size of the metal.

Please note that dependent claims are rejected because the claim from which they depend has been rejected.

***Claim Rejections - 35 USC § 102***

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or  
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 21-27 and 63-65 are rejected under 35 U.S.C. 102(e) as being anticipated by Merchant et al (5,523,259).

Merchant et al teach a method that comprises forming a Ti layer 24;

Forming three Al-based metal sub-layers on the Ti layer 24,

Wherein the first Al-based metal sub-layer 16.1 has a grain size less than 250 nm, the second Al-based metal sub-layer 16.2 has a grain size of 250-800 nm and the third Al-based metal sub-layer 16.3 has a grain size of 250-1000 nm, and

Wherein a Ti-aluminide compound forms at the interface between the first sub-layer 16.1 and the Ti layer 24, and

Wherein all of the metal layers are formed by sputtering (col. 4, lines 7-8), and

Wherein the Al-based metal may be Al-Cu (col. 4, lines 44-45).

See Figs. 2-7 and accompanying text.

Claims 21-24, 27 and 63-65 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al (5,534,463).

Lee et al teach a method that comprises forming an AlCu metal layer 39 (col. 13, lines 25-27) that comprises grain sizes of 0.3-0.4  $\mu\text{m}$  (col. 13, lines 48-50) and a thickness of 400 nm (col. 13, line 24) by sputtering.

See Figs. 17-18 and accompanying text.

Claims 21-23, 27 and 63-65 are rejected under 35 U.S.C. 102(e) as being anticipated by Eguchi (5,373,192).

Eguchi teaches a method that comprises forming an Al layer 53 by CVD that comprises a grain size of 10  $\mu\text{m}$  or more.

See Fig. 8E and accompanying text.

Claims 39-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Cote et al (5,262,354).

Cote et al teach a method that comprises forming a metallization layer 12 by CVD, sputtering, evaporating or other well known means, wherein metallization layer 12 comprises Al, Cu or AlCu alloys; and forming a metal layer 16 by CVD, plating or other techniques,

See Fig. 3b and accompanying text.

Cote et al teach a method that comprises forming a first metal layer 18 by sputtering; and forming a second metal layer 12 by CVD, evaporating or other well known means, wherein the second metal layer 12 has a larger thickness than the first metal layer 18, and wherein the second metal layer comprises Al.

See Fig. 5a and accompanying text.

Claims 52-62 are rejected under 35 U.S.C. 102(e) as being anticipated by Hasunuma et al (6,090,701).

Hasunuma et al teach a method that comprises forming a barrier layer 11, wherein the barrier layer is an amorphous refractory metal nitride (col. 29, lines 24-34); and

Forming a Cu film 8, wherein the Cu film has a grain size of 0.3  $\mu\text{m}$  or more (col. 35, lines 1-10)

See Fig. 2D and accompanying text.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merchant et al in view of Toyoda et al (5,709,958).

Merchant et al teach a method that comprises forming a Ti layer 24;

Forming three Al-based metal sub-layers on the Ti layer 24,

Wherein the first Al-based metal sub-layer 16.1 has a grain size less than 250 nm, the second Al-based metal sub-layer 16.2 has a grain size of 250-800 nm and the third Al-based metal sub-layer 16.3 has a grain size of 250-1000 nm, and

Wherein a Ti-aluminide compound forms at the interface between the first sub-layer 16.1 and the Ti layer 24, and

Wherein all of the metal layers are formed by sputtering (col. 4, lines 7-8), and

Wherein the Al-based metal may be Al-Cu (col. 4, lines 44-45).

See Figs. 2-7 and accompanying text.

However, Merchant et al do not teach that the final layer 16.3 is a Cu layer.

Toyoda et al teach a method wherein Cu may be used as the uppermost metal layer (col. 6, lines 56-60).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method taught by Merchant et al by forming the final

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metal layer of Cu because Cu can be used in place of AlCu in a metal wiring structure (see col. 6, lines 56-60 of Toyoda et al for a list that contains AlCu and its alternatives).

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 21, 22, 24-27 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 18-23 of U.S. Patent No. 6,030,895. Although the conflicting claims are not identical, they are not patentably distinct from each other because it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method recited in claims 18-23 of U.S. Patent No. 6,030,895 by forming the metal conductor of a soft metal since soft metals such as Al, Cu, Ag and alloys thereof are commonly used in interconnection structures.

Claims 28-38 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 7-17 of U.S. Patent No.



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6,030,895. Although the conflicting claims are not identical, they are not patentably distinct from each other because it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method recited in claims 18-23 of U.S. Patent No. 6,030,895 by forming the metal conductor of a soft metal since soft metals such as Al, Cu, Ag and alloys thereof are commonly used in interconnection structures.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. Brophy whose telephone number is (703) 308-6182. The examiner can normally be reached on M-F (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

J.L.B.

jlb  
July 28, 2002

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800